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NAVY UNDERWATER SOUND REFERENCE LAB ORLANDO FLA  
HAZELTINE DT 287/BQA-8 HYDROPHONE SERIAL B70 DT 288/BQA-8 HYDRO--ETC(U)  
FEB 66

F/G 17/1

UNCLASSIFIED

USRL-CALIBRATION-2405

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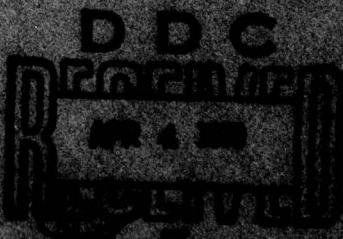
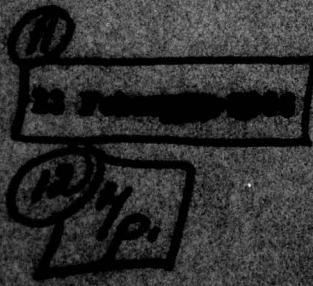
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Classification of

DD-1000 PTT 201/20A-3 Hydrophone Serial No.

201 200/20A-3 Hydrophone Serial A-1000



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Department of the Navy, Office of Naval Research  
USN UNDERWATER SOUND REFERENCE LABORATORY  
P. O. Box 8337, Orlando, Florida 32806

EMR/hs  
RP-2983  
23 Feb 1966

**CONFIDENTIAL - Group 4**

**CALIBRATION REPORT No. 2405**

**Subj:** Haseltine DT 287/BQA-8 hydrophone serial B70 and DT 288/BQA-8 hydrophone serial A-199; calibration of (U)

**Ref:** (a) BUSHIPS ltr C-9674 Ser 1622D-0905 of 13 Dec 1965  
(b) USRL Calibration Report No. 2105 (RP-2658) of 28 Oct 1963

**Encl:** (1) Drawings USRL 41111 through 41113 and 20113

1. Calibration measurements on the subject hydrophones were requested by the Bureau of Ships in reference (a).

2. The hydrophones were hydrostatically tested to insure their capability for withstanding the desired pressure 3000 psig. This precaution is required because implosion of a hydrophone in the tube facility can damage the facility transducers and result in considerable expense and delay for repairs. Hydrophone DT 287/BQA-8 serial B70 failed at 2900 psig. The hydrophone filled with water when a hole developed about 1/8 in. from the metal clamping band. Hydrophone DT 288/BQA-8 serial A-199 received no apparent physical damage from 3000 psig pressure held for 30 minutes.

3. Drawing USRL 41111, enclosure (1), shows the results of free-field voltage sensitivity measurements made in the low-frequency tank in the frequency range 5 to 1000 Hz at the hydrostatic pressures 0 and 1000 psig and the temperature 22°C. Free-field voltage sensitivity measured in the tube facility in the range 100 Hz to 1.5 kHz at the pressures 0, 1000, and 3000 psig and the temperature 10°C is shown on drawing USRL 41112. The frequency ranges of the low-frequency tank and the tube facility can not be extended; they are characteristics of the systems. Except in the frequency range shown, there is no capability at the USRL for sensitivity measurements at pressures above 1000 psig.

4. Measurements in the anechoic tank consisted of free-field voltage sensitivity in the range 2 to 12 kHz at the pressures 0, 300, 500, 700, and 1000 psig and the temperature 8°C. The results are shown on drawing USRL 41113. Directivity measurements on a similar hydrophone were reported in reference (b); they were not made in the tests reported here. There is no capability for making directivity measurements at pressures above 1000 psig.

5. Orientation was as described for a cylindrical hydrophone on drawing USRL 20113. A cross marked on the hydrophone case served as the zero-degree reference.

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6. All measurements reported here were made in accordance with American Standard Procedures for Calibration of Electroacoustic Transducers, Particularly Those for Use in Water, Z24.24-1957. The USRL has adopted the international unit of frequency, the hertz (1 hertz = 1 Hz = 1 cps; 1 kilohertz = 1 kHz = 1 kc/sec).

*Eva M. Raybun*

EVA M. RAYBUN

**Copy to:**

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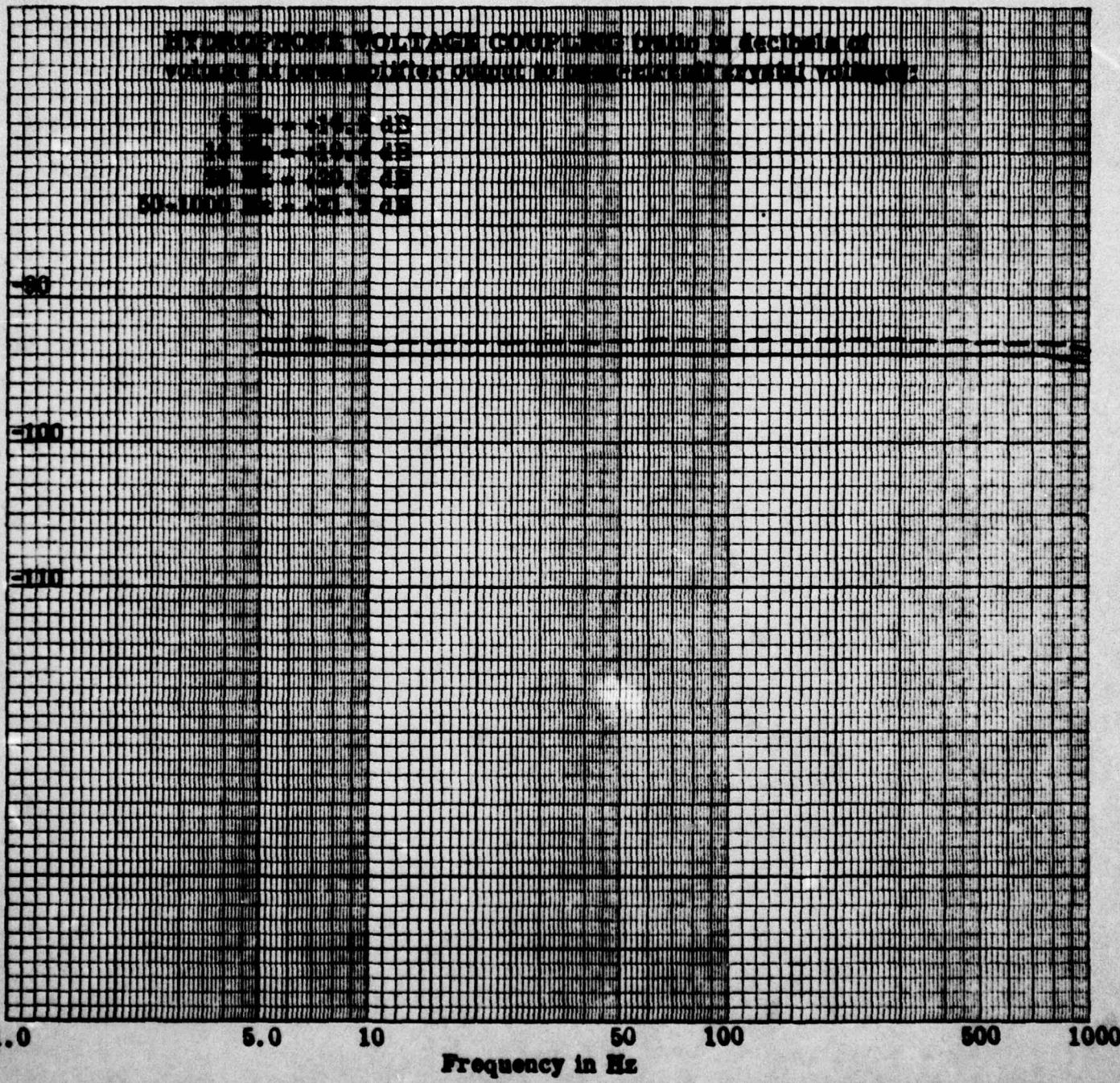
Proj. No. RP-2983  
Date: Jan 1966

FREE-FIELD VOLTAGE SENSITIVITY  
Hazeltine DT 288/BQA-8 Hydrophone  
Serial A-199  
Open-circuit crystal voltage

— 0 psig before and after pressure  
- - - 1000 psig

Water temp: 22 °C

MEASUREMENTS MADE IN ACCORDANCE WITH AMERICAN STANDARD Z.24.24-1957



ONR USE RL-ORL-3960/6 (3-61)

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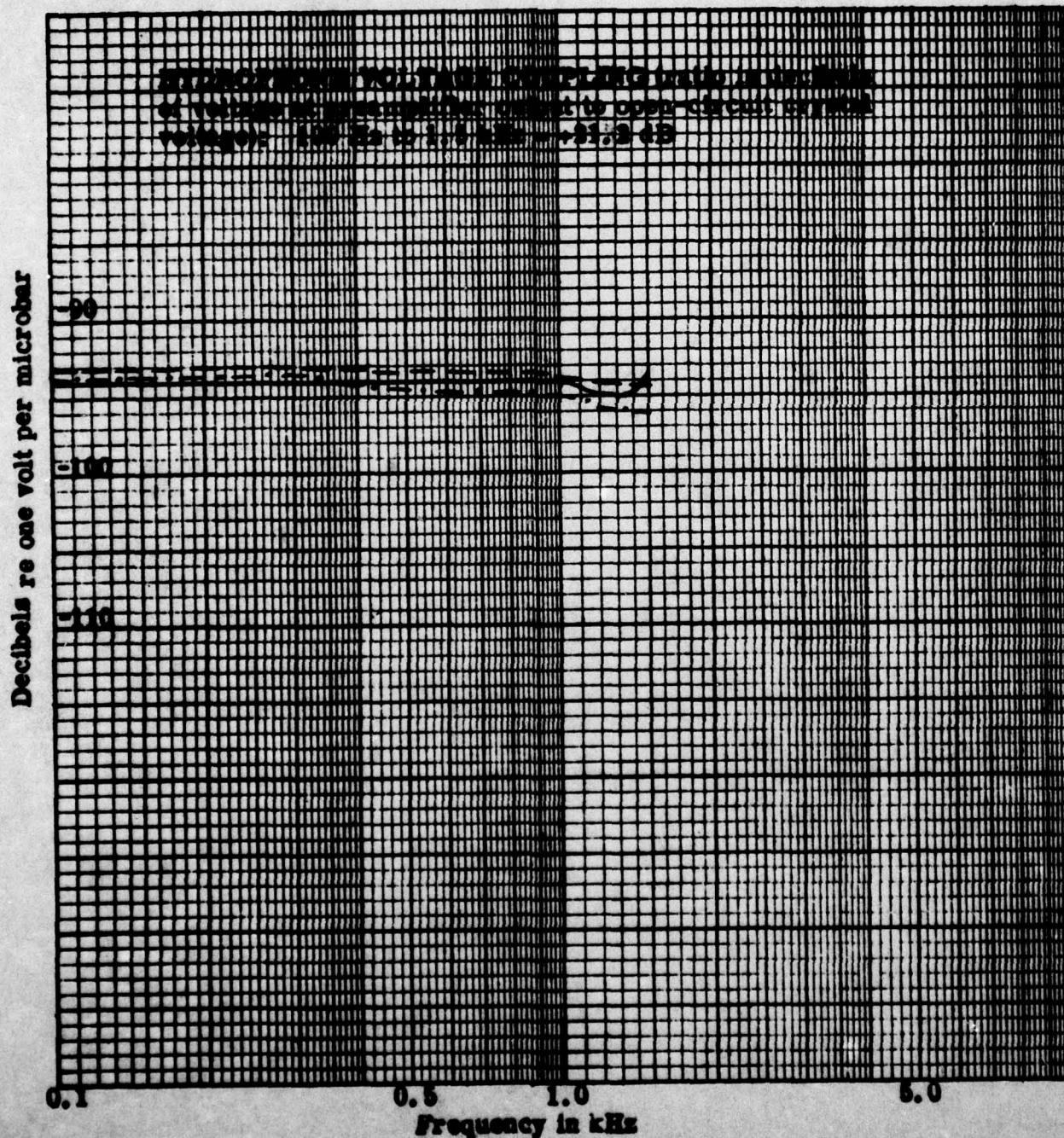
USRL No. 41112  
Proj. No. RP-2983  
Date: Jan 1966

FREE-FIELD VOLTAGE SENSITIVITY  
Hazelton DT 288/BQA-8 Hydrophone  
Serial A-199  
Open-circuit crystal voltage

— 0 psig  
- - - 1000 psig  
- - - 3000 psig

Water temp: 10 °C

MEASUREMENTS MADE IN ACCORDANCE WITH AMERICAN STANDARD Z.24.84-1957



END USRL ORL 3880/5 (3-61)

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USRL No. 41113

Proj. No. RP-2983

Date: Feb 1966

**FREE-FIELD VOLTAGE SENSITIVITY**

Haseltine DT 288/BQA-8 Hydrophone

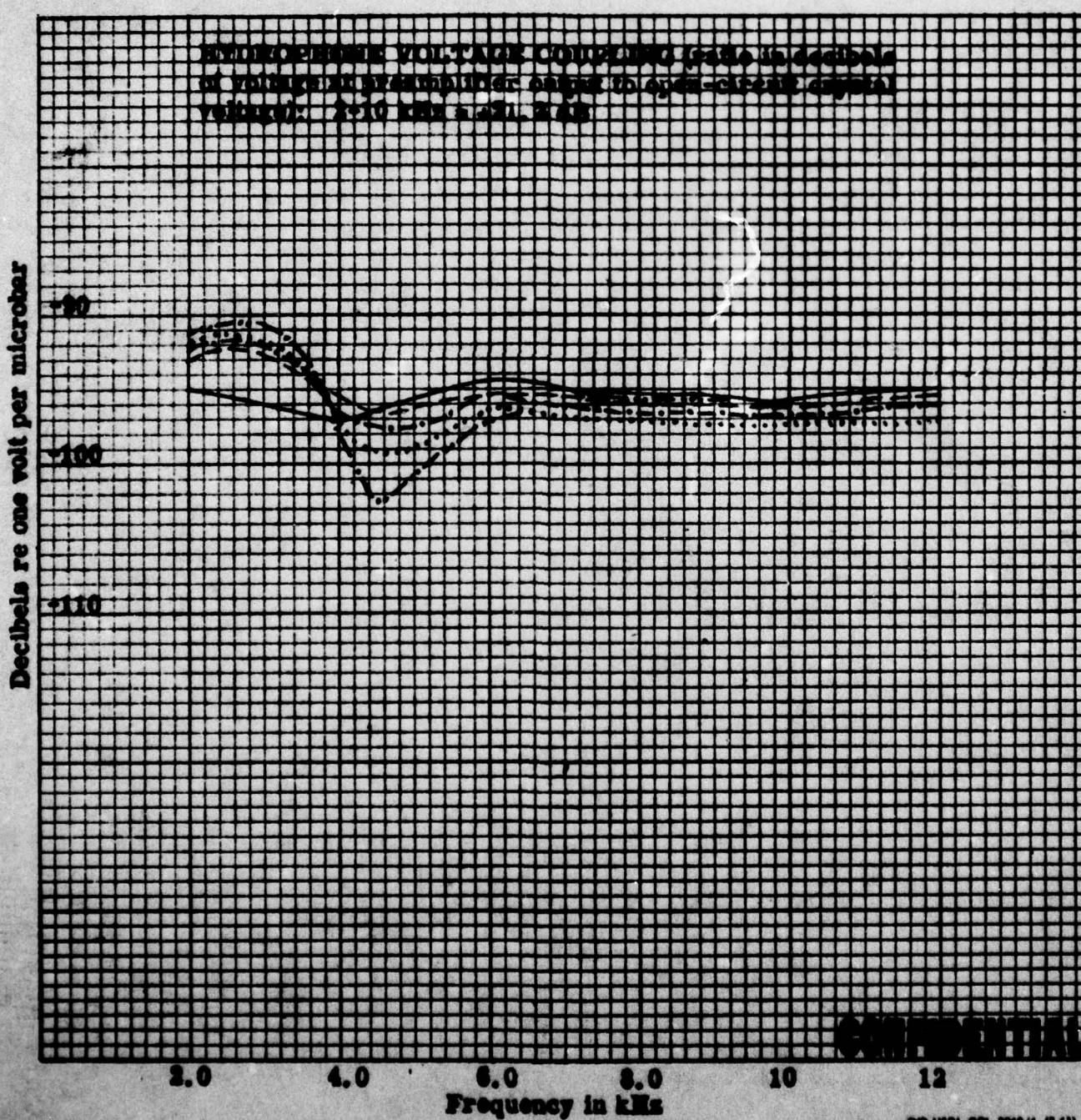
Serial A-199

Open-circuit crystal voltage

— 0 psig      — 1000 psig  
— 300 psig      — 0 psig after pressure  
— 500 psig  
— 700 psig

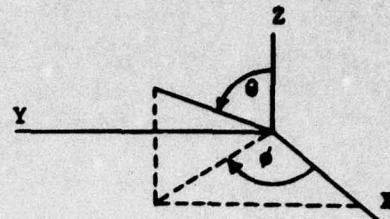
Water temp: 8 °C

MEASUREMENTS MADE IN ACCORDANCE WITH AMERICAN STANDARD Z.24.24-1957



#### COORDINATE SYSTEM FOR TRANSDUCER ORIENTATION

The left-handed coordinate system of the American Standard Procedures for Calibration of Electroacoustic Transducers Particularly Those for Use in Water, Z24.24-1957, is used. The transducer is fixed with respect to the coordinate system and has its acoustic center at the origin. The angle  $\phi$  is equivalent to the azimuth angle in sonar operation.



#### PLACEMENT OF TRANSDUCER IN COORDINATE SYSTEM

| Transducer Type      | Transducer Orientation in Coordinate System                                                                                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Point, or Spherical  | Points on surface that coincide with the X and Z axes shall be specified.                                                                                                                                    |
| Cylindrical, or Line | The axis of the cylinder or line shall coincide with the Z axis. A reference mark in the XZ plane and in the direction of the positive X axis will be specified.                                             |
| Plane, or Piston     | The plane or piston face shall be in the YZ plane with the X axis normal to the face at its acoustic center. A reference mark in the XZ plane and in the direction of the positive Z axis will be specified. |
| Other Configurations | Orientation shall be shown by sketch or description. This category includes line and piston types of transducers operated in an orientation other than those specified above.                                |

#### ORIENTATIONS FOR RESPONSE AND DIRECTIVITY MEASUREMENTS

Response. The calibration measurements are made for sound propagated parallel to the positive X axis ( $\phi = 0$ ,  $\theta = 90$ ), unless otherwise specified on the response curve.

Directivity. The plane of the pattern is specified, and the following conventions are observed, if another orientation is not specified on the pattern:

**XY Plane:** The positive X axis ( $\phi = 0$ ,  $\theta = 90$ ) coincides with the zero-degree direction on the pattern and the positive Y axis ( $\phi = 90$ ,  $\theta = 90$ ) is at 90 degrees measured in a clockwise direction. Rotation is around the Z axis; the positive Z axis is directed upward from the plane of the paper.

**XZ Plane:** The positive X axis coincides with the zero-degree direction and the positive Z axis ( $\theta = 0$ ) is at 90 degrees measured in a clockwise direction. Rotation is around the Y axis; the negative Y axis is directed upward from the plane of the paper.

**YZ Plane:** The positive Y axis coincides with the zero-degree direction and the positive Z axis is at 90 degrees measured in a clockwise direction. Rotation is around the X axis; the positive X axis is directed upward from the plane of the paper.